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## खाद्यान्न विश्लेषण पद्धतियाँ

भाग 1 अपवर्तन  
( तीसरा पुनरीक्षण )

## Methods of Analysis for Foodgrains

Part 1 Refractions  
( *Third Revision* )

ICS 67.060

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## FOREWORD

This Indian Standard (Part 1) (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Foodgrains, Allied Products and Other Agricultural Produce Sectional Committee had been approved by the Food and Agriculture Divisional Council.

With the increasing inter-state transactions and centralization of corporations and co-operative societies for handling foodgrains, the assessment of quality of foodgrains has assumed a greater significance. For proper assessment, it is necessary that only uniform methods of test are adopted and only those terms are used in test reports which have been defined properly. This standard has been based on national and international practices to ensure the adoption of uniform terminology and methods of test for foodgrains throughout the country. This standard would also help farmers in assessing and thus better processing of their produce. Besides, it would help in fixation of price of foodgrains on a scientific basis and in narrowing down misunderstanding between the purchaser and the vendors.

Depending upon the situation, foodgrains are either analyzed for all the requirement or only some of them. This standard has therefore been issued in several parts to cover various requirements. This Part covers the determination of refractions. The other parts are as under:

- (Part 2) : 2017/ISO 712 : 2009      'Determination of moisture content'
- (Part 3) : 2017/ISO 7971-3 : 2009      'Determination of hectolitre weight'
- (Part 4) : 2017/ISO 520 : 2010      'Determination of the mass of 1 000 grains'
- (Part 5) : 1970      'Determination of uric acid'

This Part was first published in 1967 and subsequently revised in 1977 and 1996. In the second revision, definitions of various terms had been deleted and a reference to IS 2813 'Terminology for foodgrains' was made to avoid duplication and confusion. Further, count method for bigger size foodgrains and volumetric and weight methods for smaller size foodgrains were also included. This revision is being undertaken to update the standard in line with the current analytical practices.

In reporting the result of a test or analysis made in accordance with this standard, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

# *Indian Standard*

## METHODS OF ANALYSIS FOR FOODGRAINS

### PART 1 REFRACTIONS

### ( *Third Revision* )

#### 1 SCOPE

This standard (Part 1) prescribes the methods for the determination of refractions in foodgrains to assess the marketable quality.

#### 2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

<i>IS No.</i>	<i>Title</i>
460	Test sieves :
(Part 1) : 1985	Wire cloth test sieves ( <i>third revision</i> )
(Part 2) : 1985	Perforated plate test sieves ( <i>third revision</i> )
2813 : 2018	Terminology for foodgrains ( <i>second revision</i> )
14818 : 2017/ ISO 24333 : 2009	Cereal and cereal products — Sampling ( <i>first revision</i> )

#### 3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2813 shall apply.

#### 4 PREPARATION OF TEST SAMPLE

##### 4.1 Lot

Lot shall be a stated proportion into which the consignment has been divided for evaluation of quality. From this lot a composite sample about 2 500 g shall be drawn on the basis of IS 14818. The composite sample shall be reduced to about 500 g by dividing on a sample divider. In case sample divider is not available, empty the container of the composite sample on a flat smooth surface and mix thoroughly. Spread the composite sample in a circular layer of about 12 mm to 25mm thickness. Scoop out 500 g of sample from centre, sides and different points taking care that no foreign matter is left over from the grain which has been scooped. This sample weighing about 500 g shall

constitute the test sample.

#### 5 EQUIPMENT

**5.1 Physical Balance**, of 5 mg sensitivity.

##### 5.2 Sieves

The following four IS Sieves of round holes shall be used [*see* IS 460 (Part 1)]:

	<i>IS Sieve</i>
Top	4.00 mm
Second from top	3.35 mm
Third from top	1.70 mm
Fourth from top	1.00 mm

**5.2.1** A solid bottom pan shall be used at the bottom.

##### 5.3 Enamelled Plate

Smooth flat type, 30 cm in diameter with 20 mm (minimum) raised rims.

##### 5.4 Small Scoop

With handle, of mild steel, it may be in any of the following sizes:

<i>Length</i>	<i>Width</i>	<i>Height</i>
mm	mm	mm
105	100	25
75	65	25
25	20 (Rear) 30 (Front)	10
25	10 (Rear) 20 (Front)	05

**5.5 Forceps**, of about 10 cm length.

##### 5.6 Magnifying Glass

With a handle of about 7.5 cm length and having magnification of 10X.

#### 6 PROCEDURE

##### 6.1 Visual Examination

Examine the test sample as a whole for its general condition, including odour and infestation and report

whether the sample is wholesome, clean, dry and in sound marketable condition. Examine the sample for any deleterious material hazardous to human health rendering the grain inedible.

## 6.2 Determination of Foreign Matter

For foodgrains other than rice and millets, weigh about 500 g of the test sample and record the prescribed mass. In the case of rice and millets, a test sample of about 250 g should be taken. The mass of the sample should be recorded. Pour the quantity over the set of sieves previously arranged in a way so that the sieve with the largest perforations comes at the top and those with smaller perforations are placed in the order of their sizes. Then agitate the sample thoroughly to strain out the foreign matter at various levels. As a result of this straining, other foodgrain and foreign matter like bolder pieces of clay, chaff, etc, would remain on the first three sieves according to their sizes. The topmost sieve would contain bold grains, big pieces of clay and other big sized foreign matter, while the lower sieves would contain smaller, shrivelled and badly insect infested grains and smaller foreign matter. Separate the sieves after straining and pick up all foreign matter by hand or forceps from each of them and add it to the foreign matter collected on the bottom pan. Weigh the total foreign matter of the bottom pan and calculate the percentage. Report the figure so obtained as the percentage of foreign matter in the foodgrain.

## 6.3 Refraction other than Foreign Matter

Mix the contents of the four sieves freed from foreign matter together and spread out evenly on a flat smooth surface in a circular layer of about 6mm-10mm thickness. From this spread, take exactly the specified quantity required for analysis for the grains under test as indicated in Table 1 from different sides and the middle (at least 9 places) by means of small scoops. Place the weighed quantity on an enamelled plate. Then pick out by hand with the help of a magnifying glass, if necessary, various items of refraction in the order given in Table 2, care being taken that each refraction is accounted for only once. Separate those refractions from the weighed sample and weigh on the physical balance. Calculate the percentage of various individual refractions separately on the quantity taken for actual analysis (see Table 1).

**6.3.1** For the refraction other than foreign matter in rice, carry out the analysis in duplicate and report their average.

**Table 1 Quantity of Sample to be taken for Determining Refraction Other than Foreign Matter**  
(Clause 6.3)

Sl No.	Foodgrain	Mass in g, Min
(1)	(2)	(3)
i)	Wheat	50
ii)	Maize	50
iii)	Paddy	25
iv)	Rice	20
v)	Barley	50
vi)	Gram	50
vii)	Other pulses	25
viii)	Millets	20

**Table 2 Order in which Refractions Should be Separated from the Weighed Sample (see IS 2813)**  
(Clause 6.3)

Sl No.	Refractions
(1)	(2)
i)	Other foodgrains
ii)	Damaged
iii)	Discoloured
iv)	Weevilled grains
v)	Insect damaged
vi)	Fragments
vii)	Broken
viii)	Chalky (in case of rice)
ix)	Red grains
x)	Kernels with husk
xi)	Shrivelled or immature
xii)	Varietal admixture
xiii)	Pin-point damaged
xiv)	Germ eaten grains
xv)	Egg spotted grains

### 6.3.2 Insect Damaged/ Weevilled Grains

#### 6.3.2.1 For bigger sized grains

From the sieved sample (see 6.3), measure 20 ml of the representative sample with the help of a measuring cylinder. Place the measured sample on a sample plate and count the total number of grain kernels. The Insect Damaged/Weevilled Grains shall be picked out separately, counted and calculated as follows:

Insect damaged grains, percent by number

$$= \frac{\text{Insect damaged grains in 20 ml sample}}{\text{Total grains in 20 ml sample}} \times 100$$

Weevilled grains, percent by number

$$= \frac{\text{Weevilled grains in 20 ml sample}}{\text{Total grains in 20 ml sample}} \times 100$$

#### 6.3.2.2 For smaller sized grains

There are two methods and either of them could be used. The method used shall be declared while reporting the result.

##### a) Volumetric method

From the sieved sample (*see 6.3*), measure 20 ml of the representative sample with the help of a measuring cylinder. Place the measured sample on a sample plate and pick up the insect damaged/weevilled grains separately. Measure its volume in the same measuring cylinder which was used for measuring the representative samples, and calculate as follows:

Insect damaged grains, percent by volume

$$= \frac{\text{Volume (in ml) of Insect damaged grains}}{20} \times 100$$

Weevilled grains, percent by volume

$$= \frac{\text{Volume (in ml) of Weevilled grains}}{20} \times 100$$

##### b) Weight method

From the sieved sample (*see 6.3*), weigh accurately 20 g of the representative sample in a chemical balance with a least count of 0.1 mg carefully transfer the sample to a sample plate and separate the insect damaged/weevilled grains and weigh them accurately in the same chemical balance. Care shall be taken while doing the experiment to avoid any external factors like strong wind, etc, affecting the experiment. The calculation shall be done as follows:

Insect damaged grains, percent by mass

$$= \frac{\text{Mass (in g) of Insect damaged grains}}{\text{Mass (in g) of representative sample}} \times 100$$

Weevilled grains, percent by mass

$$= \frac{\text{Mass (in g) of Weevilled grains}}{\text{Mass (in g) of representative sample}} \times 100$$

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### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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